

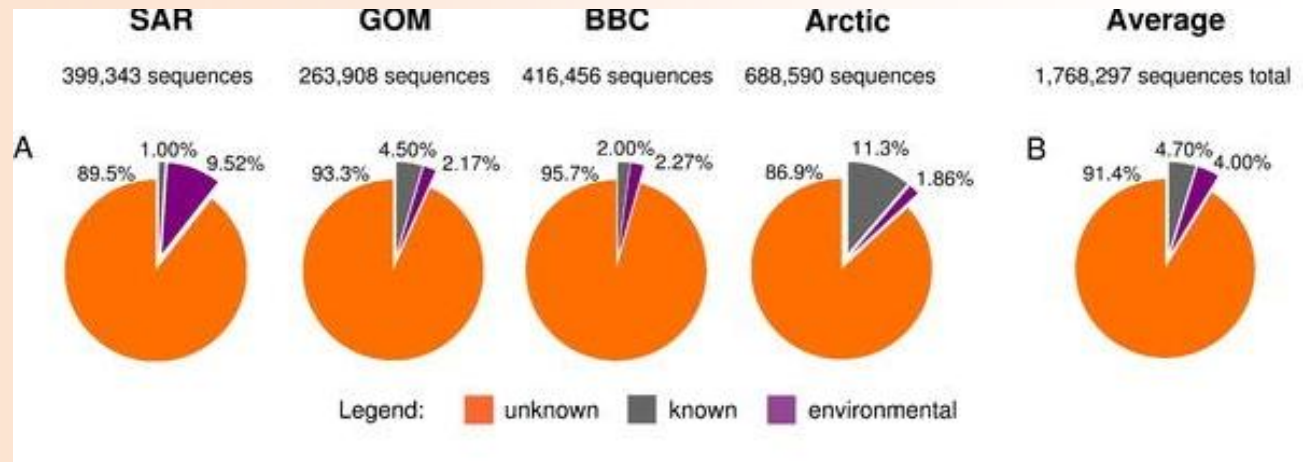
**Deciphering the Plant Viral Diversity:
a stepwise project: from a quarantine station
to an African Agro-ecosystem**

Philippe Roumagnac

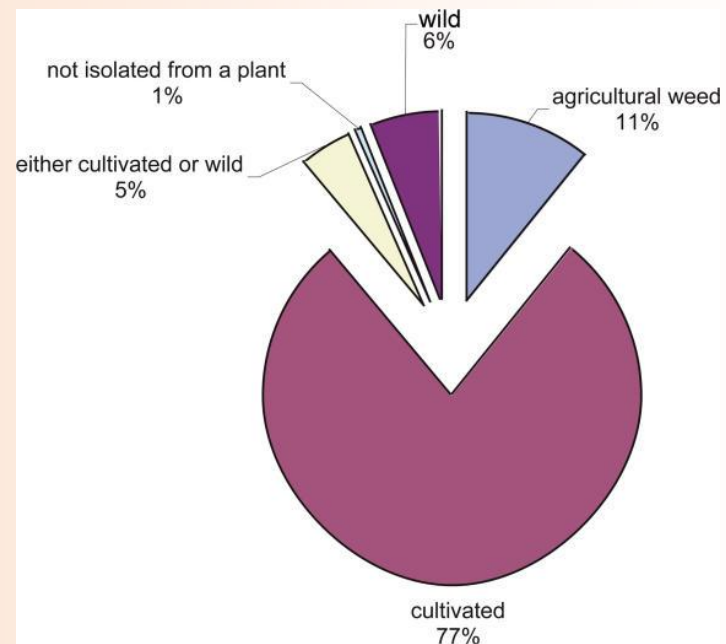
**Centre de coopération internationale en recherche agronomique
pour le développement. Montpellier-France**

Viromes are underestimated and biased

The marine viromes of four oceanic regions
Angly *et al.* (2006),
PLoS Biol. 4 (11): e368

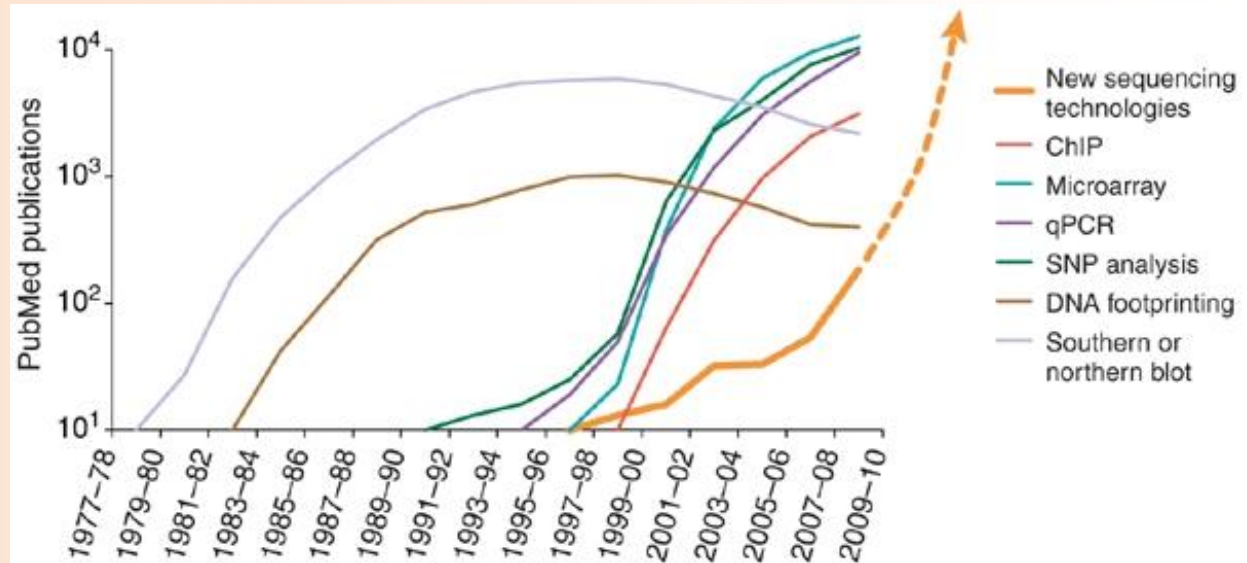


Plant Virus Biodiversity and Ecology
Wren *et al.* (2006), *PLoS Biol.* 4 (3): e80

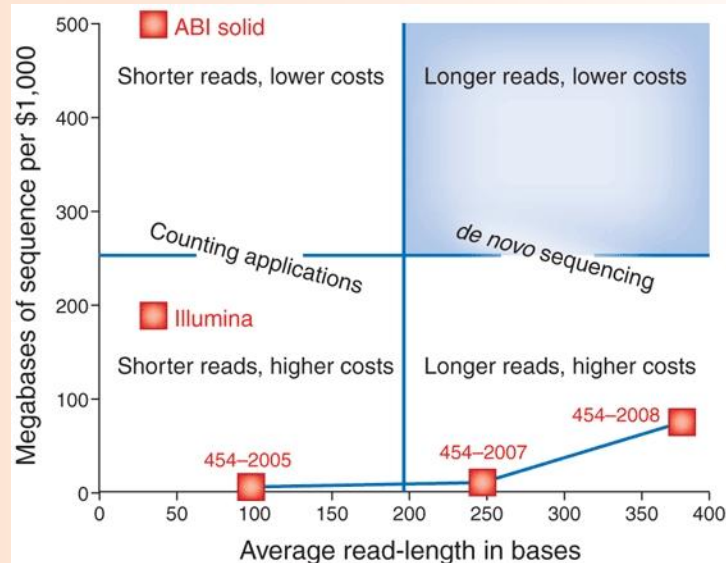


The Sequencing Technologies Era

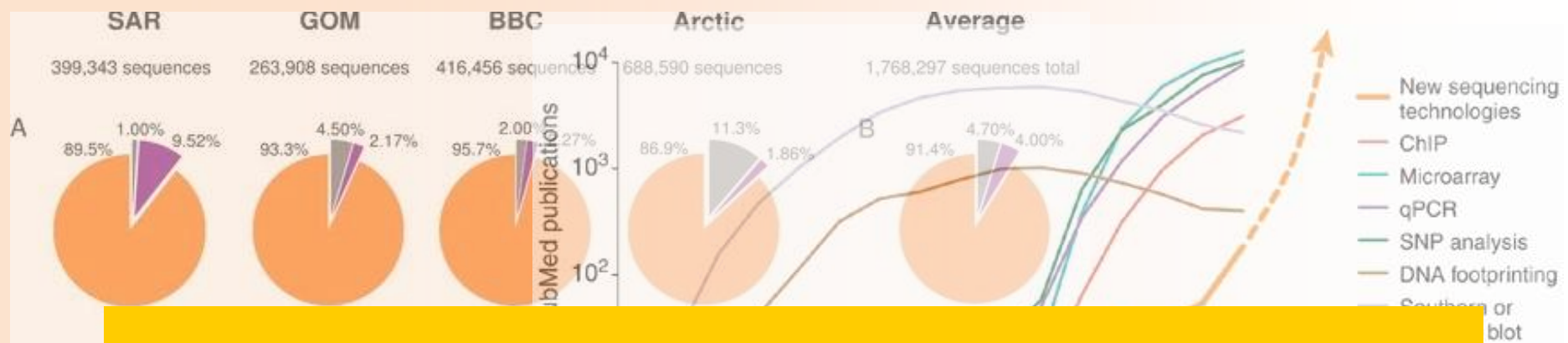
What would you do if you could sequence everything?
Kahvejian *et al.* (2008),
Nature Biotech. 26 (10):
1125-33



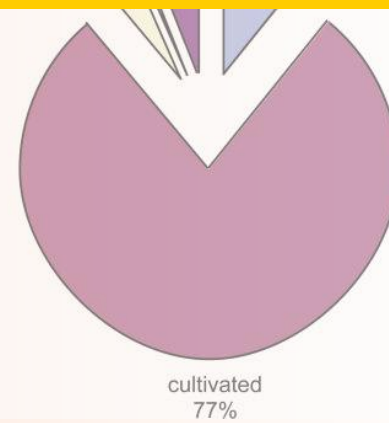
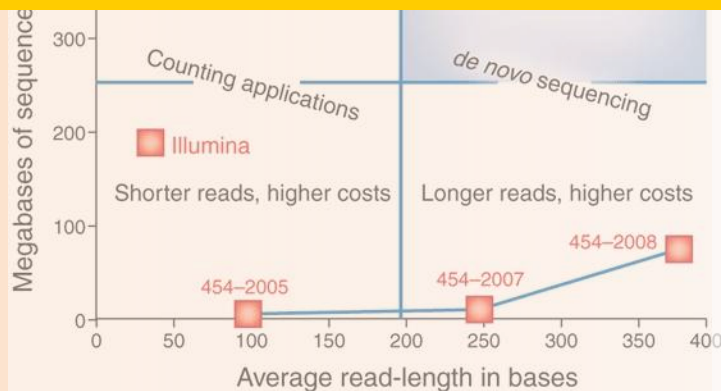
The development and impact
of 454 sequencing
Rothberg and Leamon (2008),
Nature Biotech. 26 (10):
1117-24



The sequencing Technologies Era



High-throughput sequence-independent Method Metagenomics



Questions

What is the unknown and imperceptible (asymptomatic) part of the viral biodiversity?

What is the rate of viral co-infections?

What is the spatio-temporal distribution of plant viruses

A stepwise approach



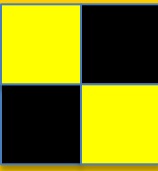
Metagenomics and quarantine: searching for the unknown



Towards deciphering the viral diversity present in an African Agro-ecosystem



Quarantine



Quarantine is voluntary or compulsory isolation, typically to contain the spread of something considered dangerous, often but not always disease

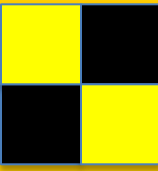
The word comes from the Italian (seventeenth century Venetian) language: *quarantena*, meaning forty day period

CIRAD sugarcane quarantine in Montpellier covers the main three quarantine operations: plant material transfers, disease detection, and elimination of pests and diseases





Quarantine



A broad cataloging and study of viruses is fundamental for conducting safe quarantines

Disease detection is one of the main quarantine operations

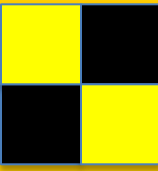
Identification of very small quantities of pathogen and, during the same test, to detect all the variants of the same pathogen

However, a major challenge remains by using the classical detection tools: identifying latent diseases and detect new and unknown viruses that could emerge in a near future.





Quarantine



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Identifying
pathogens
all

High-throughput sequence-independent Method Metagenomics

However, a major challenge remains by using the classical detection tools: identifying latent diseases and detect new and unknown viruses that could emerge in a near future.



A stepwise approach



Quarantine as a test case:

- Viral RNA extraction and purification

- Primer design, RT-PCR

- Bioinformatics



Towards deciphering the viral diversity present in an African Agro-ecosystem:

- a single-farming crop (rice or wheat)

- neighboring food crops

- adjoining wild plant species